

CRISSP - Customizable Recyclable International Space Station Packaging, Phase II

Completed Technology Project (2016 - 2019)



Project Introduction

The CRISSP Phase II effort will mature to TRL-6 recyclable launch packaging materials to enable sustainable in-space manufacturing on the ISS and future manned deep space missions. Our Phase I effort began by testing the recycling of current launch packaging materials, identifying several that are possible to recycle. We then prototyped concepts for sealable bags made with readily recyclable A.M. materials, including Ultem thermoplastic. We next developed a process for 3D printing customized containers having integral vibration-damping features, and performed testing that revealed this CRISSP packaging can provide vibration protection equivalent to or better than current foam packaging materials. To fabricate these containers, we developed novel 3D printer infills which can controllably provide a wide range of compression and flexing directions depending on the print parameters. For the highest performing infills, energy attenuation was up to two orders of magnitude better than that of a volumetrically equivalent amount of foam. We then demonstrated recycling of these test samples into 3D printer filament. The Phase II effort will mature the CRISSP technologies to flight-ready status by performing thorough materials-degradation studies to characterize the performance of the materials as a function of number of recycling iterations, maturing and optimizing our infill generation software to enable highly-automated design of customized CRISSP containers optimized for a given payload's vibration sensitivities, prototyping 3D printed packaging for a test-case vibration-sensitive payload, and then performing extensive environmental qualification testing to mature the technology to TRL-6 or better. The primary results of the Phase II effort will be a flight-ready process for packaging supplies and components for launch to ISS with materials that are readily recyclable on-orbit.



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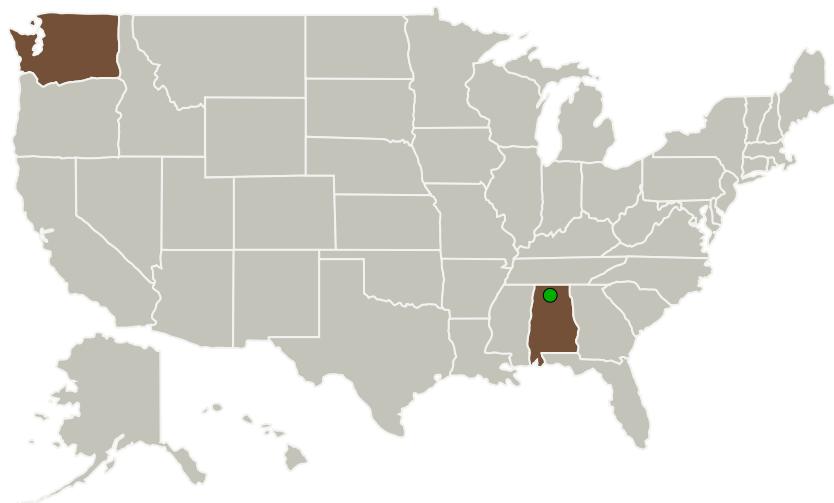
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Tethers Unlimited Inc	Lead Organization	Industry	
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Washington

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Tethers Unlimited Inc

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Jesse I Cushing

Co-Investigator:

Rachel Muhlbauer

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Images

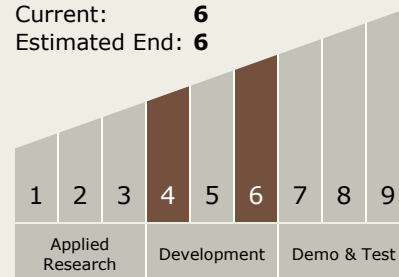


Briefing Chart Image

CRISSP - Customizable Recyclable International Space Station Packaging, Phase II
(<https://techport.nasa.gov/image/135495>)

Technology Maturity (TRL)

Start: 4
Current: 6
Estimated End: 6



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - TX12.4 Manufacturing
 - TX12.4.6 Repurpose Processes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System